Inventory Reduction Without Regret

Balancing Storage and Rebuy Costs

Marygail K. Brauner, John F. Raffensperger, and Edward W. Chan

With the drawdown after ten years of war, policymakers are keen to find savings. Unfortunately, some managers view the Army's currently high (relative to current demand) parts inventory as an inherent source of waste, which has led to a push within the Army to dispose of inventory. This push is unlikely to save money.

The primary metric now used to assess the cost of inventory is its total dollar value, calculated as purchase price times the quantity on hand. Setting a goal to reduce the dollar value of parts inventory can lead to disposing too much of it, ultimately resulting in higher long-run costs through eventual purchases or repairs that would have been unnecessary if parts had been retained.

To avoid these extra costs, we recommend that the Army assess the cost of inventory based instead on the long-run cost of inventory (LRCoI) already purchased. LRCoI accounts for storage costs, repair costs, and the risk of rebuy. We have developed LRCoI formulas that the Army could implement in its existing information systems. By using this metric, the Army would optimize inventory retention by reducing the risk of future rebuy and reducing storage costs, and it would better align retention with Army policy that calls for justification based on economics.[1]

The Army Is More Likely Than Industry to Have Surplus Inventory

The military is subject to factors that result in it holding higher surplus inventory levels than industry.[2] Demands for parts are difficult to predict because of the uncertain nature of contingencies. Variability in the military budget stemming from the political process affects training, and therefore use of equipment, increasing the uncertainty of demand. This higher demand uncertainty, coupled with long lead times, results in the Army having a higher inventory requirement than industry for the same stock-out risk.

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Goals for Inventory Reduction Should Not Be Based on Dollar Value

The Army should be cautious about disposal of inventory after conflicts and in periods of lower operations tempo and reduced demand, when long supply is most likely. Aggressive disposal can lower future readiness and lead to costly repurchases, resulting in higher LRCoI. Inventory reduction goals based on total dollar value can lead to excessive disposal because of logic that goes like this:

- The manager multiplies the quantity on hand (e.g., 150 receiver-transmitters) by the purchase cost (e.g., $25,000) and finds a large number ($3,750,000). This apparently large value of inventory is perceived as costly. However, the purchased value is a sunk cost. Disposal does not gain it back.[3] The true, continuing, long-run costs are merely for storage, repairs, and rebuys.

- For lack of better data or for simplicity, some managers calculate annual storage cost as a fraction of price, such as 1 percent. (Thus, following our example, storage cost is estimated to be $37,500 per year for the inventory of receiver-transmitters.) But storage cost actually depends on the required storage space and the rate for space, typically less than $5 per cubic foot per year. (Thus, the storage cost for all 150 receiver-transmitters with 2 cubic feet apiece would be about $1,500 per year, rather than $37,500 per year.) Because the storage cost is greatly overestimated, the savings from disposal are also greatly overestimated.[4]

It is long-run cost that the Army should minimize, not the dollar value of inventory on hand.

- Based on the previous two years of demand, a manager might forecast future demand of, say, 2 per year. The manager then divides the inventory of 150 by the forecast of 2 per year, suggesting 75 "years of supply." However, planning for 75 years should not be based on a short-term forecast of demand. Current short-term forecasts appear in the context of declining demand, reduced conflict, and reduced Department of Defense (DoD) budgets relative to those of the past decade.[5] Long-term forecasts are usually more uncertain than short-term ones; long-term forecasts should reflect periods of both lower and higher operations tempo. Using a forecast based on a longer history could result in a higher forecast of demand, such as 20 per year, which would indicate only 7.5, rather than 75, years of supply.

The Correct Metric Is the Long-Run Cost of Inventory (LRCoI) Currently on Hand

The correct metric for determining the quantity of an item to retain or dispose is the estimated long-run cost of inventory (LRCoI) currently on hand. This long-run cost includes the net present value of storage costs, repairs and washout rates for reparables, obsolescence risk, disposal, and expected purchases. It is long-run cost that the Army should minimize, not the dollar value of inventory on hand.

RAND has developed formulas to estimate LRCoI by simulating the demand, repair, and new-buy processes and converting the simulation into analytical formulas.[6] While the formulas are complicated, and contain their own assumptions, they are more likely to result in lower long-run costs than is the metric of total inventory value. RAND has also developed optimization methods to specify the inventory levels with the lowest LRCoI.

How to Implement the New Formulas for LRCoI

Logistics managers need to understand the consequence for LRCoI of choosing to discard more or less than the optimal quantity. We recommend that the Army integrate the LRCoI formulas into its logistics information systems and use LRCoI in the annual retention review process. This recommendation is consistent with the new DoD policy on supply chain materiel management procedures, which states that the rationale for retention must be economically justified and calls for regularly updating the data on which DoD retention decisions are made.[7]

Notes

[1] Department of Defense Manual (DoDM) 4140.01-V6, *DoD Supply Chain Materiel Management Procedures: Materiel Returns, Retention, and Disposition*, February 10, 2014.

Eric Peltz, Marygail K. Brauner, Edward G. Keating, Evan Saltzman, Daniel Tremblay, and Patricia Boren, *DoD Depot-Level Reparable Supply Chain Management: Process Effectiveness and Opportunities for Improvement*, Santa Monica, Calif.: RAND Corporation, RR-398-OSD, 2014. As of December 2, 2014: www.rand.org/t/RR398

[2] Eric Peltz, Amy G. Cox, Edward W. Chan, George E. Hart, Daniel Sommerhauser, Caitlin Hawkins, and Kathryn Connor, *Improving DLA Supply Chain Agility: Lead Times, Order Quantities, and Information Flow*, Santa Monica, Calif.: RAND Corporation, RR-822-OSD, 2014. As of January 2014: www.rand.org/t/RR822

[3] The Department of Defense could gain back salvage value. Usually this is inconsequentially small, and the services currently do not receive salvage value for disposals, as the Defense Logistics Agency uses salvage value to offset disposal overhead.

[4] Furthermore, inventory reduction may not lower costs unless storage infrastructure can be eliminated.

[5] Army budgets have declined from $284 billion in FY08 to $120 billion in FY15 (constant FY15 dollars) (U.S. Department of Defense, *National Defense Budget Estimates for FY 2015*, Washington, D.C., April 2014). For more discussion of the impact of declining Army budgets, see Carter L. Price, Aaron L. Martin, Edward Wu, and Christopher G. Pernin, *Where Might the U.S. Army Budget Go, and How Might It Get There?* Santa Monica, Calif., RAND Corporation, OP-331-A, 2011. As of December 2, 2014: www.rand.org/t/OP331

[6] 2014 research by Marygail K. Brauner, John F. Raffensperger, and Edward W. Chan, RAND Corporation.

[7] DoDM 4140.01-V6, 2014.

About This Perspective

The Army's currently high (relevant to demand) parts inventory is seen by some as a source of waste. This Perspective, however, argues that disposing of too much inventory can increase costs in the long run. The Army should assess the cost of inventory not on its total dollar value but instead on long-term factors such as storage costs, repair costs, and the risk of rebuy.

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